

What is Claimed is:

1. A system for electrical therapy of cardiac tissue of a heart, at least a portion
of the cardiac tissue administered with exogenous cells in a cell therapy,
5 comprising:
 - one or more catheter leads with electrodes;
 - a pulse generator comprising an interface for connection to the one or more
catheter leads, a controller programmable for a plurality of pulse delivery modes,
and a sense amplifier for sensing electrical signals from the one or more catheter
10 leads; and
 - wherein the pulse generator includes a selectable pacing mode for providing
therapeutic electrical stimulation pre-exciting the at least the portion of the cardiac
tissue administered with the exogenous cells in the cell therapy.
- 15 2. The system of claim 1, wherein the therapeutic electrical stimulation
includes a VDD pacing mode having an atrioventricular delay which is short
compared to an intrinsic atrioventricular delay of the heart.
3. The system of claim 1, wherein the therapeutic electrical stimulation is
20 provided at times between additional pacing and defibrillation therapies.
4. The system of claim 1, wherein the therapeutic electrical stimulation is
programmable for certain times of day.
- 25 5. The system of claim 4, wherein the therapeutic electrical stimulation is
programmable for sleep times.
6. The system of claim 1, wherein the therapeutic electrical stimulation is
programmable for certain levels of stress.

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7. The system of claim 1, wherein the therapeutic electrical stimulation is programmable for certain levels of activity.

8. The system of claim 1, wherein the therapeutic electrical stimulation is invoked by a programmer.

9. The system of claim 1, wherein accelerometer data is used to determine when to apply therapeutic electrical stimulation.

10. The system of claim 1, wherein lead location is used to determine types of therapeutic electrical stimulation.

11. A method for enhancing cell therapy of cardiac tissue, comprising:
applying electrical therapy using an implantable pulse generator to cardiac tissue administered with exogenous cell therapy comprising donor cells,
wherein the electrical therapy enhances one or more of engraftment, survival, proliferation, differentiation or function of the donor cells.

12. The method of claim 11, wherein the electrical therapy is pacing therapy.

13. The method of claim 12, wherein the pacing therapy includes VDD pacing mode with an atrioventricular delay which is relatively short compared to an intrinsic atrioventricular interval.

14. The method of claim 13, wherein the atrioventricular delay is varied gradually over time.

15. The method of claim 11, wherein the electrical therapy is applied based on a level of activity.

16. The method of claim 11, wherein the electrical therapy is applied at predetermined times.

17. The method of claim 11, wherein the cardiac tissue is treated *in vivo*.

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18. The method of claim 17, further comprising administering an agent that enhances exogenous cell engraftment, survival, proliferation, differentiation, or function.

10 19. The method of claim 17, further comprising administering an agent that enhances cardiac function.

20. The method of claim 17, further comprising administering an agent that enhances angiogenesis.

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21. The method of claim 11, wherein the damaged cardiac tissue is human cardiac tissue.

22. The method of claim 11, wherein the donor cells include autologous cells.

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23. The method of claim 11, wherein the donor cells include skeletal myoblasts.

24. The method of claim 11, wherein the donor cells are expanded *in vitro* prior to administration.

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25. An apparatus, comprising:
a catheter including an optical fiber;
a vacuum channel terminating in a vacuum port at a distal end of the catheter;

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retractable needle means; and
means for injecting material through the retractable needle means.

26. The apparatus of claim 25, wherein a first channel is used for the vacuum channel and a second channel is used for the retractable needle means.

5 27. The apparatus of claim 25, wherein the retractable needle means includes a needle array.

28. The apparatus of claim 25, wherein the catheter includes another lumen for positioning a stylet and wherein the catheter is pre-bent at its distal end, so that the
10 catheter can angle as a function of the position of the stylet.

29. The apparatus of claim 25, wherein a common channel is used as the vacuum channel and a channel for the retractable needle means.

15 30. An apparatus, comprising:
a catheter having a distal end;
a vacuum channel terminating in a vacuum suction port at the distal end of the catheter; and
one or more iontophoretic transfer electrodes at the distal end of the catheter.

20 31. The apparatus of claim 30, further comprising a drug reservoir at the distal end of the catheter.

32. The apparatus of claim 31, wherein the catheter is dimensioned for
25 transvenous positioning of the distal end of the catheter.

33. The apparatus of claim 32, wherein a diameter of the catheter is between 10 French to 24 French.